ISOLATION OF CELLULOSE NANOCRYSTAL FROM OIL PALM BIOMASS WITH DIFFERENT FORMIC ACID HYDROLYSIS TIME

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Final Year Project Report Submitted In
Partial Fulfillment of the Requirements for the
Degree of Bachelor of Science (Hons.) Chemistry
in the Faculty of Applied Sciences
University Teknologi MARA

JULY 2017

This Final Year Project Report entitled "**Isolation of Cellulose Nanocrystal from Oil Palm Biomass with Different Formic Acid Hydrolysis Time**" was submitted by Ahmad Afiq bin Jumhuri, in partial fulfilment of the requirements for the Degree of Bachelor of Science (Hons.) Chemistry, in the Faculty of Applied Sciences, and was approved by

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Date: 7/8/2017

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ABSTRACT

ISOLATION OF CELLULOSE NANOCRYSTAL FROM OIL PALM BIOMASS WITH DIFFERENT FORMIC ACID HYDROLYSIS TIME

Oil palm biomass is a renewable resource that can be manipulated for many applications. Nanocellulose which can be extracted from oil palm biomass is renewable and biodegradable with wide range of possible applications. Cellulose nanocrystal (CNC) was isolated using formic acid hydrolysis with different hydrolysis time from oil palm biomass in the forms of oil palm mesocarp (OPM) and oil palm empty fruit bunch (OPEFB). CNCs isolated from both type of biomass were characterized using Fourier transform infrared (FTIR), X-Ray diffraction (XRD) and field emission scanning electron microscope (FESEM). Percentage yield of cellulose nanocrystals from OPEFB and OPM were around the same range of 28 -41% showing the effect of hydrolysis time. FTIR analysis show peaks of lignin and hemicellulose at peaks 1200cm^{-1} and 1700cm^{-1} were completely removed after pretreatment process. XRD spectrum show the difference in crystal properties of the isolated CNC. CNC isolated from OPEFB show higher crystallinity index (60%) compared to that of OPM (55%). The morphology studies using FESEM show that CNC isolated from OPEFB to be globular while CNC from OPM show needle-like structure. Nanocellullose in the form of CNCs were successfully isolated from the study.